

# PATENT ABSTRACTS OF JAPAN

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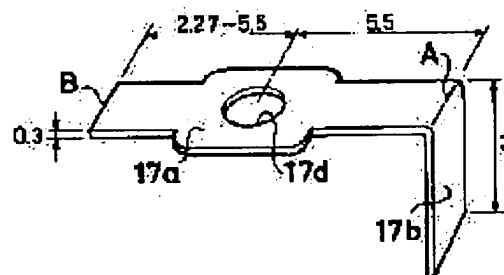
(72)Inventor : SAKAMOTO HIKARI

## (54) SEALED STORAGE BATTERY

### (57)Abstract:

PROBLEM TO BE SOLVED: To provide a sealed storage battery with high productivity, high airtightness, high electrolyte leakage resistance, and high reliability.

SOLUTION: In this sealed storage battery in which a positive terminal is welded to a head of a hollow rivet having the head and a hollow shaft integratedly formed with the head, and a sealing body is formed by fixing the hollow rivet to a sealing plate through a lead piece to be connected to a positive current collector by caulking the tip of the hollow shaft, an insulating plate, and a gasket, the lead piece has two surfaces formed by bending a thin plate, and when the length from the center of a hole 17d into which the hollow shaft of the hollow rivet is inserted to a bending line A takes 1, the length from the center of the hole 17d to the end B is 0.5-1.



## LEGAL STATUS

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the enclosed type cell which has the description in the configuration of the above-mentioned lead piece in an enclosed type cell, especially an enclosed type cell equipped with the obturation object which comes to attach a hollow rivet in an obturation plate through a lead piece, an electric insulating plate, and a gasket.

[0002]

[Description of the Prior Art] Conventionally, in enclosed type cells, such as a Ni-Cd battery and a nickel hydrogen battery, especially these small square shape enclosed type cells, what attaches in opening of a cell container the obturation object which comes to attach in an obturation plate the positive-electrode terminal which serves as a relief valve through an insulating gasket by laser welding is known.

[0003] Nothing and its battery are manufactured fitting of the obturation object 3 being carried out, and laser welding being carried out in the perimeter, and being used as sealing structure at the up opening edge of the sheathing can 2, after being inserted in a generation-of-electrical-energy element (group of electrode) into the sheathing can (cell container) 2, pouring in the electrolytic solution and laying a spacer in the shape of a rectangular parallelepiped with the flat small square shape enclosed type cell 1 as more specifically shown in drawing 1. The obturation object 3 is constituted by the positive-electrode cover-distributor end 11, the valve element 12 made of rubber, the metal hollow rivet 13, the gasket 14 made of resin, the metal obturation plate 15, the metal electric insulating plate 16 made of resin, the metal metal lead piece 17 (it serves as a washer), etc. as shown in drawing 7.

[0004] Joining of the positive-electrode cover-distributor end 11 is carried out to the head of the hollow rivet 13. Moreover, notching section 11a used as the recess way of gas is prepared in each soffit of the side face of the positive-electrode cover-distributor end 11. The valve element 12 blockades 13d of holes which were built in the positive-electrode cover-distributor end 11, and were formed in hollow shaft 13b of the hollow rivet 13. This valve element 12 will open with the gas pressure added through 13d of holes of the hollow rivet 13, if the internal pressure of a battery carries out abnormality lifting according to a certain cause and a predetermined pressure is exceeded, it makes the gas in a sheathing can discharge outside from notching section 11a of the positive-electrode cover-distributor end 11, and reduces the internal pressure of a battery. A gasket 14 secures the liquid spill-proof nature of the electrolytic solution poured in into the sheathing can, and airtightness while it intervenes between the obturation plate 15 by the side of a negative electrode, and the hollow rivet 13 by the side of a positive electrode and secures electric insulation. An electric insulating plate 16 intervenes between the lead piece 17 and the obturation plate 15, and secures electric insulation.

[0005] By the way, in the case of the small square shape enclosed type cell 1 as shown in drawing 1, the configuration of the conventional lead piece has the 2nd page which sheet metal with a thickness of 0.3mm bends and becomes as shown in drawing 8, 17d of holes of a major diameter is vacated more slightly than the outer diameter of the hollow shaft with which a hollow rivet is inserted in the 1st page 17a, and other 1st page 17b is connected with a charge collector. This lead piece serves as the washer and takes the configuration which rectangle sheet metal connected to the washer. The die length to the edge B of the core of 5.5mm (proportion 1) and the above-mentioned hole to an opposite hand of the die length from the core of the 17d of the above-mentioned holes to the ups-and-downs line A is 2mm (proportion 0.36). A washer partial outer diameter is 4mm, and the short length lay length of the rectangle part linked to a washer part is 3mm. As for field 17b by the side of charge collector connection, the long lay length of 3mm and short length lay length is 3mm.

[0006] The approach indicated by JP,7-335190,A is learned as a manufacturing method of the above-mentioned obturation object 3. That is, in order to manufacture the obturation object 3, as shown in drawing 4, assemble the hollow rivet 13, a gasket 14, the obturation plate 15, an electric insulating plate 16, and the lead piece 17,

they are made to do a handstand, the diameter of soffit section 13c of the hollow rivet 13 is expanded to punch 21, and caulking immobilization of the lead piece 17 and the electric insulating plate 16 is carried out at the obturation plate 15. next, rivet soffit section 13c which arranged the positive-electrode cover-distributor end 11 which included the valve element 12 inside on the head of a hollow rivet, and opened it as shown in drawing 5 - a cross section -- making it contact pressurizing the circular negative electrode rod 23, a cap head is pressurized with a positive electrode 24, applies an electrical potential difference between the forward negative electrodes, and welds height part 11b for welding on the rear face of a positive-electrode cover-distributor end to the head of a hollow rivet.

[0007] however, the time of expanding the diameter of a rivet soffit and carrying out caulking immobilization of the lead piece 17 and the electric insulating plate 16 with the conventional technique, at the obturation plate 15 - the hole of the lead piece 17 -- the force whose diameter the one where the distance from a core to an edge is shorter expands cannot be borne, but the soffit section of a rivet part may expand the diameter to an ununiformity so that past [ an aperture ] and rivet soffit 13c may \*\*\*\*\* to drawing 5 If a positive-electrode cover-distributor-end rear face is welded to the head of the hollow rivet 13 with the negative electrode rod 23 while the rivet soffit had expanded the diameter to the ununiformity, since the rivet lower part cannot be pressurized uniformly but the flow of a lifting current will worsen per piece, welding becomes inadequate, and poor welding arises and it becomes the cause from which a positive-electrode cover-distributor end separates. [0008] Moreover, in case the diameter of a rivet soffit is expanded and caulking immobilization is carried out with the lead piece 17 and an electric insulating plate 16 at the obturation plate 15, the ends of the lead piece 17 and an electric insulating plate 16 are curvature and a cone upwards centering on a rivet. How depending on which the lead piece 17 at this time and an electric insulating plate 16 curve has a more large distance from 17d of holes of the lead piece 17 to an edge in a short part. Connection arises inside a feeder and the obturation object acquired using the electric insulating plate which the edge curved and deformed produces problems, such as lowering of the productivity by halt of an assembly line, when carrying to the following process with a feeder. Moreover, although manufacture of a battery fits the obturation object 3 into the sheathing can (cell container) 2 which inserted the group of electrode etc., if the obturation object which used the electric insulating plate which deformed is used, nonconformity, such as colliding with a spacer, and the transformed electric insulating plate being unable to fit in closely, but becoming inadequate [ laser welding ], and becoming the cause of a liquid spill too, will also be produced.

[0009]

[Problem(s) to be Solved by the Invention] This invention was made against the background of the technical problem of the above-mentioned conventional technique, can be manufactured for high productivity in manufacture of an enclosed type cell, especially an enclosed type cell equipped with the obturation object which comes to attach a hollow rivet in an obturation plate through a lead piece, an electric insulating plate, and a gasket, is excellent in airtightness and liquid spill-proof nature, and aims at offering a reliable enclosed type cell.

[0010]

[Means for Solving the Problem] Joining of the positive-electrode cover-distributor end is carried out to the above-mentioned head of the hollow rivet with which this invention is equipped with a head and the hollow shaft formed in this at one. In an enclosed type cell equipped with the obturation object which comes to attach a hollow rivet in an obturation plate through the lead piece, electric insulating plate, and gasket by which the point of the hollow shaft is connected in total to a positive-electrode charge collector The above-mentioned lead piece has the 2nd page which sheet metal comes to bend, the hole with which a hollow rivet is inserted in oneth of them is vacated, and other 1st page is what is connected with a charge collector. If die length from the above-mentioned hole core to an ups-and-downs line is set to 1 in the direction of a long picture of the field which has the above-mentioned hole, the enclosed type cell characterized by setting the die length from the above-mentioned hole core to the edge of an opposite hand to 0.5-1 will be offered.

[0011]

[Embodiment of the Invention] Although the small square shape enclosed type cell 1 which made the shape of a flat rectangular parallelepiped as shown in drawing 1 as an enclosed type cell of this invention is explained, this invention is not limited to this mode. As shown in drawing 2 , after a group of electrode is inserted, the electrolytic solution is poured in and a spacer 18 is laid in the sheathing can 2, it is manufactured fitting of the obturation object 3 being carried out to the up opening edge of the sheathing can 2, and laser welding of the enclosed type cell 1 of this invention being carried out in the perimeter, and being used as sealing structure. The construction material usually used as a cell sheathing can can be used for the sheathing can 2, and the steel plate which performed nickel plating is mentioned.

[0012] In the obturation object 3 of an enclosed type cell 1, if it explains using drawing 7 , the obturation plate

15 is a metal lid, the crevice of an ellipse configuration is formed in the center of a top face, and 15d of holes for attaching a gasket 14 and the hollow rivet 13 in this alignment is prepared in the crevice. It is fixed to the obturation plate 15 by closing the soffit section through a gasket 14, an electric insulating plate 16, and the lead piece 17, and the hollow rivet 13 carries out the work holding the airtightness of an enclosed type cell 1. It is not limited especially if the construction material of this hollow rivet 13 can fix each part material by caulking \*\*\*\*\* , and the iron which performed nickel plating is mentioned, and the soft iron which performed nickel plating more preferably is mentioned. The hollow rivet 13 consists of head 13a which becomes the obturation plate 15 and abbreviation flush, when assembled with hollow shaft 13b, and the thing of a proper configuration is used for it in consideration of soffit partial 13c whose diameter is expanded by caulking. As shown in drawing 5 , the positive-electrode cover-distributor end 11 has head 13a of the hollow rivet 13, and isomorphism-like flange 11c, and height part 11b for welding is welded to it by spot welding, and it is fixed to head 13a of the hollow rivet 13. It generates in the side face of the positive-electrode cover-distributor end 11 inside an enclosed type cell 1, and notching section 11a used as the recess way of the gas discharged from the valve element 12 is prepared in it.

[0013] A valve element 12 opens, when the gas which occurred inside the enclosed type cell 1 exceeds a predetermined pressure, it discharges gas, and serves to keep constant the internal pressure of an enclosed type cell 1. This valve element 12 is not limited especially if the above-mentioned function is achieved, and the valve element made of rubber is mentioned. A gasket 14 and an electric insulating plate 16 serve to prevent a liquid spill of the electrolytic solution poured in into the sheathing can 2 in the obturation plate 15 by the side of a negative electrode while securing the hollow rivet 13 by the side of a positive electrode and the electric insulation between the lead pieces 17. If a gasket 14 and an electric insulating plate 16 insulate the electrical and electric equipment, and do not deteriorate with the electrolytic solution and airtightness can be maintained, it will not be limited exceptionally and plastics or rubber etc. which applied the sealant to the front face will be mentioned. Preferably, it is Nylon.

[0014] The lead piece 17 is made to go away hollow rivet 13, and sometimes carries out the work as a washer while the positive-electrode charge collector of a generation-of-electrical-energy element is connected and it connects electrically a positive-electrode terminal and a generation-of-electrical-energy element. It has the 2nd page which sheet metal with a thickness of 0.3mm bends and becomes, 17d of holes of a major diameter is vacated for the 1st page 17a more slightly than the outer diameter of a hollow shaft, and other 1st page 17b is connected with a charge collector so that the configuration of the lead piece in this invention may be shown in the case of the above-mentioned small square shape enclosed type cell 1 (for example, drawing 3 ). This lead piece serves as the washer and takes the configuration which the rectangle sheet metal part faced and connected to two places of a washer. The die length to the edge B of the core of 5.5mm (proportion 1) and the above-mentioned hole to an opposite hand of the die length from the core of the 17d of the above-mentioned holes to the ups-and-downs line A is 2.75-5.5mm (proportions 0.5-1). A washer partial outer diameter is 4mm, and the short length lay length of each rectangle part is 3mm. Field 17b by the side of charge collector connection is 3mm in long lay length, and short length lay length is 3mm. If an obturation object is manufactured using the lead piece of such a configuration, in case caulking immobilization will be carried out, the curvature of the ends of a lead piece and an electric insulating plate cannot happen easily. Conductive sheet metal is used for the lead piece 17, and a nickel foil or nickel-plating sheet metal is preferably mentioned to it.

[0015] If the enclosed type cell 1 by this invention is explained using drawing 7 , the obturation plate 15 will be first equipped with a gasket 14. Crevice 15b of an ellipse configuration is formed in the center of a top face of this obturation plate 15, and 15d of holes is vacated for that crevice 15b and this alignment. A gasket 14 has a more slightly [ than 15d of holes of the obturation plate 15 ] small outer diameter, and a bore is formed in the upper bed periphery of slightly larger body 14b than the outer diameter of hollow shaft 13b of the hollow rivet 13, and its body 14b at one, and it has flange 14a to which the outer diameter carried out the almost same ellipse configuration as the obturation plate 15. After inserting body 14b of a gasket 14 in 15d of holes of the obturation plate 15, body 14b of a gasket 14 is equipped with hollow shaft 13b of the hollow rivet 13. It cannot be overemphasized that you may make it insert these in 15d of holes of the obturation plate 15 by this although it means inserting the hollow rivet 13 in 15d of holes of the obturation plate 15 through a gasket 14 after inserting hollow shaft 13b of the hollow rivet 13 in body 14b of a gasket 14 as a procedure.

[0016] Next, as shown in drawing 4 , these are made into an upside-down, and head 13a of the hollow rivet 13 lays for making it a plinth 22 contact, and, subsequently to this order, carries out outer fitting of the electric insulating plate 16 and the lead piece 17 made of nylon to hollow shaft 13b of the hollow rivet 13. An electric insulating plate 16 is for intervening between the obturation plate 15 and the lead piece 17, and securing these insulation, and makes the almost same rectangle as the obturation plate 15 by plane view. 16d of holes of a major diameter is vacated for a part for the core of an electric insulating plate 16 more slightly than the outer

diameter of body 14b of a gasket 14, and hollow shaft 13b of the hollow rivet 13 is inserted in this hole. The lead piece 17 is the thing of the above-mentioned publication, and hollow shaft 13b is inserted in 17d of holes of a major diameter more slightly than the outer diameter of the above-mentioned hollow shaft 13b. The hollow rivet 13 which attached the above-mentioned each part material outside is caulked using punch 21. The conical surface is formed at the head and punch 21 expands the diameter of the point of a hollow rivet by this conical surface. [0017] Subsequently, as shown in drawing 5, joining of the positive-electrode cover-distributor end 11 which holds the valve element 12 made of rubber in the interior, and serves as relief valve equipment is carried out to head 13a of the hollow rivet 13 which caulking ended in the height part 11b for welding, and the obturation object 3 is formed in it. As this obturation object 3 is shown in drawing 2, a generation-of-electrical-energy element (group of electrode) is inserted, the electrolytic solution is poured in, fitting is carried out to opening of the sheathing can (cell container) 2 with which the spacer 18 was laid, laser welding of the obturation perimeter is carried out, it considers as sealing structure, and an enclosed type cell 1 is formed. A spacer 18 is not limited especially if spacer ability is achieved, and Nylon is mentioned as the construction material.

[0018]

[Example] This invention is not limited by these, although an example is given and this invention is explained still more concretely hereafter.

[0019] If the die length to the ups-and-downs line A is set to 1 from 17d core of lead piece {holes made of soft iron of having performed nickel plating shown in example 1 drawing 3, the die length to Edge B will use 0.8(it expresses lead piece proportion 0.8:1)} from 17d core of holes. Assemble the hollow rivet made of soft iron which performed nickel plating, the gasket made of nylon, the obturation plate made from a steel plate which performed nickel plating, the electric insulating plate made of nylon, and the lead piece made from nickel, they were made to do a handstand, and the diameter of the soffit section of a hollow rivet was expanded to punch. Next, it was made to contact, pressurizing a negative electrode rod at the rivet lower part which arranged the positive-electrode cover-distributor end which included the valve element inside on the hollow rivet head section, and opened it, and it connected with the positive electrode, and the cap head applied the electrical potential difference, welded a part for the height for welding on the rear face of a positive-electrode cover-distributor end, and manufactured the obturation object. The manufactured obturation object was used, after having inserted the group of electrode, pouring in the electrolytic solution and laying a spacer in the sheathing can made from a steel plate which performed nickel plating, the obturation object was fitted into the up opening edge of a sheathing can, laser welding of the perimeter was carried out, it considered as sealing structure, and the battery was manufactured. The count of an assembly line halt in the case of manufacture of 1,000 batteries and the fluidity number around for 1 minute are shown in a table 1. The result of having measured the welding reinforcement of the positive-electrode cover-distributor end of the manufactured battery for 10,000 shots of every counts of welding is shown in drawing 6.

[0020] Like example 2 example 1, when the die length to the ups-and-downs line A was set to 1 from 17d core of lead piece {holes, the die length to Edge B used 0.5(it expresses lead piece proportion 0.5:1)} from 17d core of holes, and the battery was manufactured. The count of an assembly line halt in the case of manufacture of 1,000 batteries and the fluidity number around for 1 minute are shown in a table 1.

[0021] When the die length to the ups-and-downs line A was set to 1 from 17d core of lead piece {holes shown in example of comparison 1 drawing 3, the die length to Edge B manufactured the battery like the example 1 from 17d core of holes except having used 0.4(it expressing lead piece proportion 0.4:1)}. The count of an assembly line halt in the case of manufacture of 1,000 batteries and the fluidity number around for 1 minute are shown in a table 1. The result of having measured the welding reinforcement of the positive-electrode cover-distributor end of the manufactured battery for 10,000 shots of every counts of welding is shown in drawing 6. Like the example 1 of example of comparison 2 comparison, when the die length to the ups-and-downs line A was set to 1 from 17d core of lead piece {holes, the die length to Edge B used 0.36(it expresses lead piece proportion 0.36:1)} from 17d core of holes, and the battery was manufactured. The count of an assembly line halt in the case of manufacture of 1,000 batteries and the fluidity number around for 1 minute are shown in a table 1.

[0022]

[A table 1]

|       | リード片寸法比  | 組立ライン停止回数 | 流動数    |
|-------|----------|-----------|--------|
| 実施例 1 | 0.8 : 1  | 0         | 90~100 |
| 実施例 2 | 0.5 : 1  | 0         | 90~100 |
| 比較例 1 | 0.4 : 1  | 11        | 50~60  |
| 比較例 2 | 0.36 : 1 | 11        | 50~60  |

[0023] As shown in a table 1, since the fluidity of a parts feeder increases, the manufacture approach of the battery of this invention has productivity dramatically high [ it is twice / about / the example of a comparison for which the count of a halt of a line is 0 times, and the fluidity number for 1 minute also used elegance conventionally, and ] in manufacture of the battery which has the lead piece which is within the limits of this invention of examples 1-2, compared with a conventional method. Moreover, although there is little wear of an electrode full-dog-point edge and the welding reinforcement of a positive-electrode cover-distributor end was stable also after 60,000 shots in manufacture of the battery which has the lead piece which is within the limits of this invention of an example 1 as shown in drawing 6 , in manufacture of the battery which has the lead piece of the conventional article of the example 1 of a comparison, piece decrease of an electrode full-dog-point edge occurred from 30,000-shot grade, and welding reinforcement fell with the increment in a shots per hour.

[0024] In addition, as the welding strength test approach (compression test), it fixed to the clamp on both sides of the cell, and on the cell, the load cell made from stainless steel was used, the load was added to the positive-electrode cover-distributor end of the cell upper part by part for load cell speed 100mm/, and welding reinforcement was measured at the right angle. The measurement size was 1,000 pieces about one data.

Moreover, as the count of an assembly line halt, and a fluidity number, 1,000 batteries were manufactured and the count of an assembly line halt in a manufacture assembly line and the fluidity number of the line for 1 minute were measured.

[0025]

[Effect of the Invention] The description is in the configuration of said lead piece, in case the diameter of a rivet soffit is expanded and caulking immobilization is carried out with a lead piece and an electric insulating plate in manufacture of an enclosed type cell at an obturation plate, a rivet soffit does not expand the diameter to an ununiformity, but the enclosed type cell with which deformation of an electric insulating plate does not break out is obtained in an enclosed type cell equipped with the obturation object which attached the enclosed type cell, especially the hollow rivet in the obturation plate by this invention through the lead piece, the electric insulating plate, and the gasket connected to a positive-electrode charge collector. The enclosed type cell obtained can be manufactured for high productivity, is excellent in airtightness and liquid spill-proof nature, and reliable.

[Translation done.]

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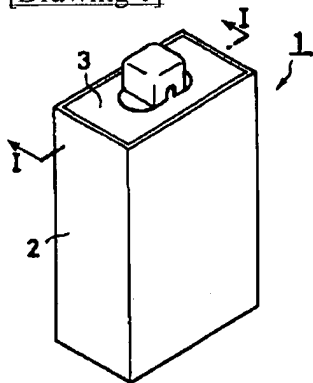
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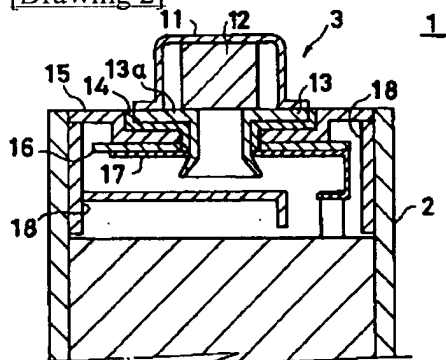
DRAWINGS

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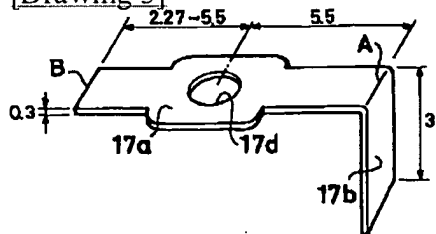
[Drawing 1]



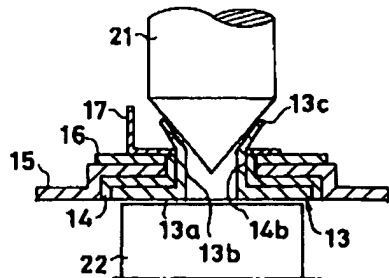
[Drawing 2]



[Drawing 3]

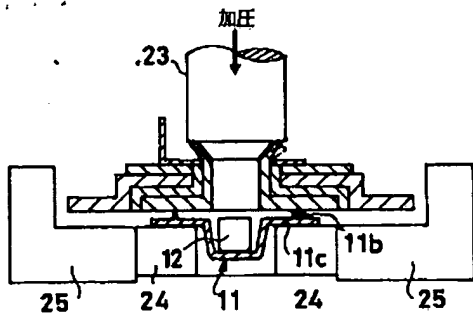


[Drawing 4]

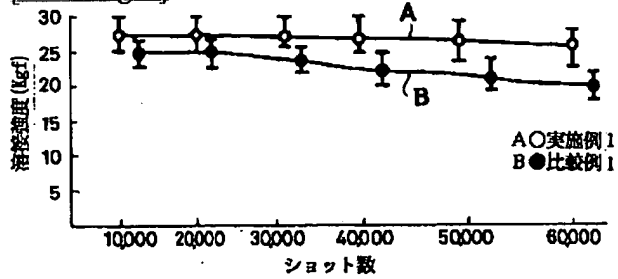


[Drawing 5]

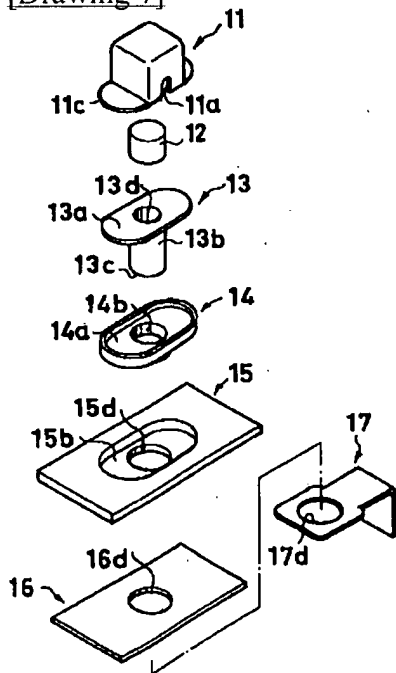
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[Drawing 6]



[Drawing 7]



[Drawing 8]

